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MONTANA WATER DATA USER'S CONFERENCE

October 2, 1986
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PREFACE

These proceedings are based on a transcript of a panel discussion on water resources data management needs, held in Butte, Montana on October 2, 1986. This panel discussion was part of the Montana Water Data User's Conference, co-sponsored by the U.S. Geological Survey (USGS) and the Montana Natural Resource Information System (NRIS). The conference is part of an effort by NRIS, the Department of Natural Resources and Conservation (DNRC), and the USGS to determine needs for water resources data management as perceived by users of water resources data in Montana. These findings will be used to design a Water Resources Data Management System that best meets the needs of Montana data users.

INTRODUCTION

JOE MORELAND
U.S. Geological Survey

The cosponsors of this conference thought that this might be a good forum for evaluating how the Natural Resource Information System (NRIS) could best create a water resources data management system. Hopefully we'll stimulate discussion on how we might accomplish this task. I'm going to turn the program over to Gerhard Knudsen from the Department of Natural Resources, who will lead the panel discussion. I encourage everybody, again, to ask questions and make comments. If we provide the Water Data User community with some insights about what we're doing and why we're doing it, perhaps we can better serve their needs.

OPENING REMARKS

GERHARD KNUDSEN
Dept. of Natural Resources & Conservation
Water Resource Division

Before getting into the major topic, I'd like to take a moment to introduce the people involved in our panel discussion. First of all, we have Larry Gruel, Director of Power Operations Planning, Montana Power Company. Next we have Bob Thompson, Staff Attorney for the Environmental Quality Council in Helena. The next individual is Ron Russell, Regional Hydrologist with the U.S. Forest Service in Missoula. Next is Gary Elwell, Hydrologist with HKM Associates in Billings. Then we have Phil Farnes, who is the Snow Survey Supervisor with the U.S. Soil Conservation Service in Bozeman.

I was very pleased with the talk that Tom Patton provided us this morning since, in my judgement, it provides an example of the sort of thing that we're trying to achieve in developing a water resources information system for Montana. The work being done here in Butte with the groundwater data is representative of what we would like to do with a larger water resource information system. You'll remember that Tom pointed out that his system would be a satellite to the larger water data system we're hoping to develop within Montana.

As a background to our panel discussion, I'd like to go back in time and provide you with some information that relates to why we're into this notion of water resource information in the state of Montana. Perhaps the place to start would be back in 1967, when the Montana Legislature passed what is known as the Water Resources Act. This was a fairly broad and pervasive legislative enactment, and it set forth a whole series of water management objectives that the state was to achieve. The sorts of things they talked about included optimizing the beneficial use of water. The Legislature also said that the Department of Natural Resources and Conservation was to work on behalf of the State to coordinate the development of the State's water resources. It recognized the importance of water supplies for both public recreational uses and the conservation of fish and wildlife resources. Another objective that the Legislature set forth was that of coordinating the development of our water resources with the management of the other water-related resources in the state of Montana.

After having listed these management objectives, the Legislature said that, in order to achieve them, a state water plan would have to be developed. Not unlike other states in the West, we now had a mandate to develop a state water plan. I think its significant that the very first thing that the water planning statute calls for is a continuing, comprehensive inventory of the water resources in this state. The water planning statute also goes on to say that this continuing inventory will include groundwater information.

In response to the mandate that was given to us in 1967, we have certainly collected a great deal of information. But most of it is information in support of specific water planning efforts. We've done some

statewide data collection programs; an example might be the water use report we prepared in the mid 1970s for the whole state of Montana. But in characterizing our data collection efforts it is perhaps best to say they were clearly not systematic and could hardly be called very organized.

I think there were two actions that really got us interested in a more comprehensive information system on the water resources of Montana. The first one was the National Water Use Data System (NWUDS) which dates back to the late 1970s. That's when we really first became involved in what I would call a systematic data collection and management effort. NWUDS was a nationwide water data program sponsored by the U.S. Geological Survey. Through that program, states were provided funding and assistance to take a look at their information needs and to focus on how they could best collect information concerning the use of water within their states. With the funding that was available to Montana, we established a plan development committee comprised of individuals representing a variety of agencies many of whom are in this room today. The purpose of that group was to take a look at the state of our current water use information and, in turn, suggest the best way to proceed with collecting needed water use information. We made a preliminary survey of users, and we looked at database systems in other states, particularly those who had already started programs through the NWUDS effort. We then hired a consultant to help to set up an operational framework, the basic conceptual design of the program. It was not underway, yet we did have an idea of how it would work. That is where we come to the whole basic concept for the system. As Tom earlier acknowledged in his talk, our thought was to have centralized access to a decentralized database system. That is still the thinking that prevails today. We were not talking about an information system where everyone dumps all their water use information in a central file and some sort of mega-entity handles it. At that point we had the concept, but we were still faced with turning it into reality. At the time we concluded our study on a water use data system for the state of Montana, the Legislature provided funding for a special committee, known as the Water Policy Review Advisory Council. It was a group that was convened in the late-1970s and provided important impetus to the implementation of a water data system for Montana. The Council was a very influential group, comprised of 17 individuals who represented a cross-section of interests, including legislators, public interest and environmental organizations, and other groups representing business interests. Importantly, the group had short tenure. It was created to take a look at key water resource issues before the state at that time.

Some of the issues considered by the group were dam safety, public interest criteria to be used in granting water use permits, interstate water allocation, and the need to provide funding for water development in Montana. Because of the way the group operated and the nature of its composition, some very important things resulted from its efforts. Several times this morning I heard reference to the funding that's been made available through the Water Development Program. That program began as an idea that was fostered through this group. Suffice it to say the group had influence and was able to separate the wheat from the chaff and come up with ideas that should be pursued further.

At the time we didn't realize that actions of the Council would have such an impact. On the other hand, we did see it as an influential group and decided to approach them on the basis of the learning experience that had eminated from the NWUDS program. More specifically, we asked them to listen to our thoughts on a broader water resource information system that was patterned after the concept we had developed for the water use component. Basically, the case we presented to the Council began with the premise that water resource decisions are increasingly complex, and they do require data. However, part of the data collection efforts to date seemed to be rather single-purposed and frequently not helpful to other agencies that have to make important water management decisions. We saw that the data collection methods were often very costly, inaccurate, and quite slow. Some data certainly was stored and made available in machine-readable format. However, a lot of it, of course, was in cardboard boxes in someone's basement. There was really no central record. We presented that sort of case to the Committee, and subsequently recommended that we a water resource data base system be developed for the state of Montana. We further recommended that the system be patterned after the NWUDS concept that we had earlier developed. The Committee supported our recommendation and, in turn, supported legislation that was introduced in the 1981 Legislature for a biennial appropriation of $156,000 to start the process of developing this information system. The intent at the time was to also develop a water resource data base system with some matching funds that were available through the U.S. Geological Survey. Again, the rationale for our recommendation to pursue this information system was: sound decision-making on the management of our water resources is crucial to the well-being of Montana; there are long-term implications to these decisions; and data are needed if we are to make defensible decisions. On the other hand, such data must be acquired at a reasonable cost and with a minimum of duplication between agencies. Although the Legislature was appreciative of these arguments, the funding was not forthcoming. The appropriation measure carried all the way through to the end of the session. The funding was there, at first, but the measure died right at the end. I think it is important to note however, that once the issue was brought before the Legislators, they became receptive to the notion of creating some form of centralized water resources information system for Montana.

That was back in 1981, and of course this is 1986. In the last five years a considerable amount of relevant activity has taken place. I'd therefore like to have Bob Thompson, who is with the Montana Environmental Quality Council, explain to you what has happened during the past few years and where we stand today with respect to development of a water resource information system.

NRIS AND THE WATER RESOURCES DATA MANAGEMENT SYSTEM PROPOSAL

BOB THOMPSON
Environmental Quality Council

The Environmental Quality Council is an arm of the Montana Legislature that examines a variety of natural resources issues. The Council also staffs the Water Policy Committee, which was established in 1985 to examine water issues and to report biennially to the Legislature. One issue that the Water Policy Committee examined during this past year was water data management. The Committee has determined that water data are a very important need in the state, and that accurate data are crucial to effective and consistent decision making by lawmakers and water management personnel.

Recent History Relating to State Water Resource Data Management

The Department of Natural Resources and Conservation (DNRC) hired a consultant in 1981 to help develop a water protection plan for Montana, with a focus on the Missouri Basin. The consultant's report, entitled "A Water Protection Strategy for Montana," noted that "At the present time much of the water resources data is fragmented, neither indexed nor inventoried, not recorded in a standard format, and most importantly, not readily accessible to those who need the information for making management decsions." The report recommended that a water resources data management system be developed as a part of the state's water protection strategy.

This recommendation was not acted on by the 1983 Legislature, although the legislature did address the recommendation in 1985. The 1983 Legislature did establish the Natural Resource Information System, popuary known as NRIS. Larry Thompson, the Director of that program, is attempting to establish a comprehensive information management system for Montana, with a focus on water resources data. This system answers the legislative directive to develop a "comprehensive program for the acquiition, storage and retrieval of the existing data relating to the natural resources of Montana." It is a broad mandate, covering all natural resource data and, at least implicitly, including water resources data.

The 1983 Legislature did not actually fund NRIS, but it did fund a special water study. A legislative committee was formed, called the Select Committee on Water Marketing, to address the issues affecting the Missouri Basin states on how water is to be shared, and the potential for the marketing of water by Montana to entities outside our state (or perhaps in-state). The Select Committee, as a result, studied a variety of topics, including water data management.

The Select Committee recognized that one of the most important ingredients in guaranteeing effective and comprehensive water policy is accurage data upon which to base decisions. The Committee strongly endorsed a comprehensive water data management program for the state under the direction of DNRC. HB 680, the bill endorsed by the Committee and

enacted by the 1985 Legislature, stated that DNRC should "establish and maintain a centralized and efficient water resources data management system, sufficient to make available and readily accessible, in a usable format to state agencies and other interested persons, information on the state's water resources, other state water resources that affect the state, existing or potential uses, and existing and potential demand." That was a very specific delegation of authority to the Department to find out where the data are, organize it, and make it usable for state water managers.

Thus, there are two statutes that address water data management: one dealing with NRIS, which is a comprehensive program for natural resources data management, and one which delegates to the DNRC authority to establish and maintain a centralized water data management system. A commendable point is that the two entities are not fighting over who has primary authority. In fact, the entities have worked together since 1985 to establish a cooperative, interagency effort to devise a state program that will ultimately provide centralized management of water resources data.

The cooperative approach was stimulated by a panel discussion at the Water Policy Committee meeting in November 1985, where several water data experts discussed problems in using water data. An informal committee was established after the meeting, involving NRIS, DNRC and other representatives, to discuss the most cost-efficient and effective way of creating a water resources data management program. Because NRIS was given specific responsibility for organizing natural resource data, the Committee recommended that NRIS use water resources data as the focal point for its program.

A proposal was developed over a series of meetings for water development program funding during the 1987-89 biennium. The project has a $147,000 budget, of which $97,700 would come from the water development program and the remainder from the NRIS budget. It is one of approximately 117 proposals for water development program funding. These proposals are ranked initially by DNRC Water Development Bureau staff, and then by an advisory committee. This administrative ranking is submitted to the Legislature for final consideration and re-ranking. So it's essentially three processes: an in-house ranking, an advisory committee ranking, and the final ranking by the Legislature.

There will be approximately $1.6 million available for projects in the 1987-89 biennium. The DNRC staff ranked the NRIS project as second among all projects; that ranking can be changed in the next two steps. DNRC estimates that 22 of the 117 projects will be funded in 1987.

The outlook is optimistic that something will happen in the area of state water resources data management. Certainly it speaks positively for the cooperative effort among state agencies and institutions, and for the role of NRIS and DNRC in providing leadership.

Project Objectives

A principal project objective is to inventory water data sources in the state. In the water data field, this may also be referred to as indexing. Essentially, this means finding out where the data is and summarizing what it addresses. With this information, water data users anywhere in the state will be able to go to NRIS for information about specific problems they are studying. NRIS, with its indexing system, will be able to tell them where valuable data sources exist.

A second project objective is to design a system to access this data. NRIS' design will not invoke taking all available water data and putting it into one central computer in Helena. Instead, NRIS' proposalinvolves designing a system that will locate data in Montana (perhaps elsewhere as well) and then access it by computer networking. The system will gather only the information reequested specifically by the user.

A third objective is to establish a central point to help water data users. NRIS is already attempting to serve this function. That is, it is attempting to become a referral service for questions about natural resources data and to help potential users determine where data are located.

Another objective is to design and promote a quality control system to ensure the validity of water resources data. When the Water Policy Committee met in November 1985, a panel of water data experts commented that some existing water data may not be of high quality. At minimum, the quality of data varies from one collector to another. One component of the NRIS proposal involves organizing a group of professionals to devise a quality control system. This may be a very difficult task because scientists often have unique research designs and their own way of doing things, which in another person's opinion may not be the best way. But regardless, the NRIS project will attempt to develop some quality control measures.

The study does not propose to collect raw data. Because of the cost of collecting data, the water Policy Committee, the Advisory Committee to this proposal, and others felt that money could be better spent if used to develop good access to existing data.

As mentioned earlier, the study does not attempt to centralize data. There will not be a mega-computer in Helena that contains all water data. NRIS will attempt only to access data that is collected in computers, and perhaps in other forms, across the state.

Finally, the project does not attempt to achieve the entire data-accessing system. This is phase one of a two-phase project. Phase two will hopefully begin in 1989 and will implement the accessing system designed during phase one.

Those are the objectives and non-objectives of the proposal. There are a couple of other project components that are worth mentioning. One

is that NRIS will try to automate data that are not automated (that is, put data into machine-readable format). Also, NRIS will work with a coordinating group composed of state agencies, federal representatives andprivate sector representatives to undertake other missions, including a specific user needs survey of persons who use water data extensively. NRIS will not, however, attempt to duplicate otheer programs; instead, it will complement those programs by serving an organizational function.

Conclusion

Of all the proposals submitted for water development program funding, the NRIS proposal is the only one formally endorsed by the Water Policy Committee. This indicates, at least to some degree, how legislators view the importance of water resources data.

Data users also feel that water resources data are important. NRIS hired a consultant in March to survey 481 possible respondents concerning what natural resource data needs are most important. Water resources data was ranked number one by a substantial margin. Approximately 50 percent of the respondents indicated that access to water resources data was a serious problem deserving improvement. That survey, as much as anything, documents the need for the NRIS project.

COMMENTARY
GERHARD KNUDSEN

I think you can see that we do have a mandate to develop a water resource information system, and that interest in such a system is there. Maybe for the first time in the six or eight years that I've been involved in the effort to get such a system going, it appears that we may actually be near to obtaining funding needed to develop the system and get it in operation.

With this background, we should now turn to the panel discussion portion of this presentation. Our purpose in convening this panel was to assemble a group of speakers who would develop a dialogue on this topic, and, in turn, generate some comments from those of you who are in attendance today regarding perceptions of a water resources information system for Montana. As a result, we hope to obtain comments that will help us to further design the system.

I think if you'll reflect on to the agencies or organizations that are represented here today, you'll see that we have a cross-section of entities involved. We have federal, public, and private groups represented. All of whom collect data but, in many regards, use it to a different purpose. I think this will allow us to see how different people perceive the need for data and information in the management of Montana's water resources.

In terms of discussion format, I'd like to call on these individuals to give a brief, five to ten minute discussion that and addresses basically three points. The first is to highlight their organization's uses for water resources data; secondly, to point out any problems they've experienced in obtaining speedy access to the data they need; and thirdly, some suggestions on how we might go about solving problems in getting access to the information that we need. Following these discussions I would then like to solicit comment or questions from those of you who are here today. Again, ideally, I hope we can spend most of our time addressing the latter two questions I pointed out -- How do we define our existing data management needs? How can we solve the problems in gaining access to these data? We see this discussion to be very, very important to the development of the Water Resource Information System for Montana.

Rather than introduce each speaker separately, I'll give the order of those who will speak: Ron Russell with the Forest Service, Phil Farnes with the Soil Conservation Service, Larry Gruel with the Montana Power Company, and Gary Elwell with HKM Associates.

WATER DEVELOPMENT NEEDS OF THE U.S. FOREST SERVICE

RON RUSSELL
U.S. Forest Service
Missoula

Before I get into the questions that we've been asked to address, I would just like to point out that the Forest Service Northern Region is not primarily a data gathering agency. Our mission is to manage the ten national forests within the state of Montana. Our in-house data gathering basically serves only to facilitate that management and to plug gaps in the general data of others. We use all types of data: climatic, stream flow, water quality, the whole gamut of water resource data. A general comment is that it seems like every year there's less and less of that data available as agencies are reducing their monitoring programs. So we find that gaps are there initially, and that they are also expanding.

I'd like to present a brief summary of some of the uses of water resource data in our management area. First is resource assessment -- what resources do we have out there, and what data do we have to work with. Our water resources data is being displayed in forest planning documents. As part of that same effort, we are evaluating the effects of alternatives of land and resource allocations on the national forest. Both require water resource data. This type and level of data, we find is readily available from USGS, the Soil Conservation Service, Snow Survey data, and other national data gathering programs.

The second phase, one that we're very actively involved in, is project planning, including best management practices design and implementation. Here we're dealing with site assessments: where you put a campground, what's the extent of the flood plain, what type of water flows do you expect through bridge openings -- that type of site assessment. We use effects modeling to predict sediment yields and water yield increases from forest activities. Here again, we find that as we get more site-specific the data becomes less available. When we're dealing with a particular watershed or particular land types, we really have problems finding access to that type of water resource information.

The major area of our own in-house collection of water resource data is for monitoring the effects of our activities. Here we're looking for change: we're looking to see if our predictions are accurate so we can make in-course corrections on our land allocations and our management activities. In terms of water resources data, that's probably where the Forest Service has the most data in-house: both water quantity and water quality associated with specific project monitoring.

Adjudication in the state and the Forest Service negotiation with the Montana Reserve Compact Commission has demanded that we have a ready access to water resource data, and we have found that it is lacking in a lot of cases -- or we've been unable to find it. Cumulative effects analysis, where we're looking at the effects of multiple land ownerships on both water quantity and quality, avalanche hazards and warning systems,

fire predictions, and a host of other management needs exist needing water resource data.

The second question that we've been asked to address is the problem of getting speedy access to the data needed. With the exception of the USGS data which many of our systems are designed to accommodate, one of the biggest problems we've had is lack of knowing what's out there. Having to individually seek out that information by calling different agencies and universities to ask if they happen to have some information on a certain drainage or type of problem requires a lot of time and effort. When you do find data, it is often very agency-specific. You may be able to use just a portion of it and that amount of data that you can use must often be converted and entered by hand into your own analysis programs.

In some cases data has been collected and stored in boxes in someone's basement or in warehouses. If you want to go in and take the charts and actually reduce them into a useable form, it's available. Our agency has a few of those crates of data in our basement and we are working to recover as much of the data as we can.

Unknown sources also exist. I'd like to describe an example that I ran into about four years ago on the Beaverhead National Forest. We were doing a management review. In the course of that review we stopped to talk to BLM in their field office and found out that BLM had a water quality monitoring station less than a half of a mile below the Forest Service monitoring station. Both were attempting to determine the effectof cattle on that particular drainage. I think some coordination could've been in order and it has since been coordinated.

A lot of people are out there collecting data. A lot of times it happens that if you drive by and see someone down the stream with waders on, and you run down and ask what they're doing and they tell you, you realize that you can use that type of information. But it's the first time you've ever found out that they were actually studying in that area.

The third question -- suggestions on how these problems could be solved. The first thing that I feel the Forest Service would support would be the state Water Resource Data Information System to put some order in the water resource data in the state of Montana. I think we would be a prime user of this data base. I'm not sure that we can resolve, or that the state should be actively trying to resolve, this agency-specific question. That in time will become a computer interface question and I think it can be solved between the agencies and hopefully we will look into that in the future.

The Forest Service, as an agency, is trying to ensure that the data we collect is of high quality and that it is analyzed in a timely fashion. We would hope that that data would be encompassed in the state water resource system. I think that would be a help even within federal agencies to keep track of what other agencies are doing in terms of water resource monitoring. It would be a help to us to know what universities and other agencies are doing within the state.

I can finish up by making a few points: that any system would have to be user friendly (the question of being able to call and ask is certainly user friendly). It would have to be easy to update. I think that a lot of systems have a lot of effort put into them the first go-around and everyone's pleased with them. Then they send you out the forms the next year and you reply. The third year you get another stack of forms and you say, oh no, not that again and do not reply. Pretty soon the system loses its credibility. NAWDEX I think is a good example of that problem.

It should be geographically based so that we can look at an area's specifics. One thing that was encouraging in Bob's talk was the concern about the quality of data. I don't know if a data system should get involved in setting quality, but the quality of data must be recognized and reported within any data system.

WATER DATA MANAGEMENT NEEDS OF THE SOIL CONSERVATION SERVICE

PHIL FARNES
Soil Conservation Service
Bozeman

The Soil Conservation Service is unique in that we're a data collector, data user, and data interpreter. We need real-time data, we need historic-time data, and we cover the whole state. Most of the real-time information is obtained in the SCS by the Snow Survey Unit. We have about 70 automated sites in the mountains that collect snow-water equivalent data, temperature, precipitation, and some other parameters. This is part of a 500-site network system in the western United States. This information is available to all of our cooperators who can get into this system and access the data on a real-time basis.

In addition, we're involved with stream gauging at some of our P.L. 566 projects. We work with a lot of private reservoir operators. We develop reservoir operating plans from in-flow out-flow information. We have saline areas where we're interested in obtaining water quality information. The SCS is also responsible for the soil survey program.

By February, almost all of the 52 SCS field offices in Montana will have remote terminals and computer capabilities. As part of the database system, "CAMPS" will have a lot of agricultural data that can be used by our field offices for developing farm plans. With a small staff and small budget, we're being forced to go more and more to automation. This CAMPS system will be providing basic information on climate, soils, crops, fertilizer, erosion, sediment, and we're going to need a lot more information that is not presently available.

We utilize a lot of data, primarily historic, for the design of irrigation projects, for forecasting stream flow, channel stabilization, and agricultural programs. We use all kinds of natural resource data. Water resources data is very necessary. Precipitation and temperature are extremely important and we utilize National Weather Service data, data we collect ourselves, information that we obtain from local farmers, ranchers, or anybody else that collects data.

Reservoir storage is also important. We need to adjust the observed stream flows that we're working with to a "full natural flow" or the amount of water that would've passed down the river had the reservoir not been there. We prepare our forecast based on the amount of water that is coming into the system, not necessary what is being released from the reservoir.

Within our database we have two computers, both based in Portland. One is referred to as the SNOTEL Computer. This is the computer driven system that collects all of the data from the 500 automated sites in the western United States. We utilize meteor-burst communications. Most of our sites are reporting twice daily with snow-water equivalents, air temperature, and precipitation. Information for the current water year is

stored on this computer. We have another system which stores and processes historic and current information and the SNOTEL information. In addition to the information that we're collecting ourselves, we have a lot of monthly stream flows from the USGS, Bureau of Reclamation, and private individuals. We have monthly and daily precipitation and maximum-minimum temperatures from the National Weather Service and other sources. Data from about 170 National Weather Service climatic stations with maximum-minimum temperatures is loaded into our system. This is data our field office people need for irrigation water management and other farmer assistance programs.

The 70 SNOTEL sites bring in data once or twice daily. Some of this information goes back to 1964 water year. We have two segments to our data base. One is an historic data base and the other is the current water year's information. If you want to pick up everything through today from the beginning of time, you need to go into two segments right now. This helps us maintain the relationship between what we call provisional data and data that's been verified or checked. You can get into some real problems when you start pulling in raw data and don't check and analyze it before it goes into your permanent database. At the end of a water year and after all data has been validated, the current year's data is transferred into the historic data base. There are still people who believe that when data comes out of a computer it's perfect and there are no problems. But I'll guarantee you that's not the situation.

Within our system we've also loaded many of the hydrologic models and a complete statistical package. Some of these are useable by cooperators, but most are for internal SCS use.

We analyze and interpret a lot of the information that we collect. All of our printed material that comes out in a printed report. A lot of our analyses and comparisons are now on the computer. People that need this information don't have to wait for the printed material but can sign on to the computer and receive the information three to four weeks before it comes out in print. If any of you desire to obtain information from the SCS computers and are not presently a cooperator, just get in touch with me. There is presently no charge, but you need a modem to be able to call up the computer in Portland and you need to pay for telephone line charges.

The second question to be addressed is speedy access to data you need. Since we're mainly involved as a data collector this has not been a major problem with us. We've been in the forecasting business since the 1930's, and a lot of our data collection has been developed so that we can get the information near real-time so it can be used to make forecasts. Some of the other systems that we're now able to use, like the Bureau of Reclamation System out of Boise (which we can use to pick up from both the west and east side of the continental divide), and the USGS system, provide access to real-time data. Access and data availability have not been a major problem.

One of the problems that we see with a centralized database is providing quality control and locating sources of data. It's surprising

how many farmers and ranchers have 20 or 30 years of daily precipitation/daily temperatures that they've been keeping on the calendar. Most of them are tickled to give it to somebody so it can be utilized. A lot of the data is good. Maybe it doesn't meet National Weather Service standards, but it's sure better than having a data gap in some places. We try to work with these people wherever we can and obtain these kinds of data. If the centralized data base system is set up so that it gathers unpublished or other available data, I think it'll be very useful. However, adequate technical staff must be available to search out this data and to screen it for some level of accuracy.

One of the concerns I have is with the liabilities involved. Right now if someone signs on to our system and they use our data and it results in an engineering error, I know who's going to be in front of the judge defending the information. With the state system, you're going to have to be careful how this data is presented and interpreted because a lot of users cannot tell the difference between good data and bad data.

Setting up an information system that will direct users to different sources of information and how to get this data would be good. The universities are collecting a tremendous amount of data, and, as far as I know, very little of it has ever been cataloged or put into a place where it's available. If you're lucky you might get a copy of the written report, but in most cases this material gets buried someplace in a cardboard box. Some of it's good and some of it's bad but it does need to be made available to other people. We receive inquiries all the time, almost daily, asking if we know whether any data is being collected here or there, if we have any data, if we know of another source. One of our main jobs is referring people to sources of data and providing data.

WATER RESOURCES DATA NEEDS OF THE MONTANA POWER COMPANY

LARRY GRUEL
Montana Power Company
Butte

The Montana Power Company needs water data primarily to operate and plan the operation of our 14 hydroelectric projects in the state of Montana. Certainly data are needed both for long-range planning and for short-term planning. In long-range planning we use historical data, such as the USGS records. We also use our own database that we've developed over the years. We are also very interested in the day-to-day planning of the hydro system. To do that we're interested not only in data here in Montana, but in data from everywhere in the Pacific Northwest. If we can get real-time or at least very recent data, that helps us a great deal in analyzing the power market. Since we participate in the wholesale power market in the entire western United States, we can better make use of that market if we can get more information.

Our long-range planning and short-term planning also have to take into effect the coordination agreements we have with other power companies and with other users of the water. It's very important that we keep track of what's going on, both historically and with the most recent data we can get. We find we are also using our water database a great deal to substantiate water rights claims in the adjudication process that's going on right now. We also need the hydrologic data for new construction, and for maintenance and repair of existing facilities.

I mentioned that we have used the USGS historical records, but primarily what we use are the records that we have developed ourselves over the years. We have water data at nearly all of our projects essentially from the time they were constructed to the present. We make extensive use of the SNOTEL forecasts and also of the HYDROMET system, where we can get very recent stream flow data by accessing the computer in Boise. The water data is especially important to us because of the effect that it has on the wholesale power market. We have access to the SNOTEL and the HYDROMET computers because we are a cooperator. We help collect the snow survey information on those sites where it's done by hand. We also have participated in the cost of installing a HYDROMET station, so we can get access to the stream gaging information.

With respect to the Water Resources Data Management System that's being put together, I've found it is very important to have access to the raw data somewhere. Especially with our dam operators, I've run into cases where they put a little judgement into what the numbers were before they recorded them. In some cases they were taking a five-day running average and other days seven-day running averages. One of the things I've found valuable was to get rid of that -- to have the raw data so people can't adjust it any way they want, at least until you get it to a point where you get someone interpreting the data that does it on a consistent basis.

With respect to historical water records, I've found it especially important to include good information on the number of acres irrigated in the past. When I go to do an analysis of how to operate one of our hydroelectric projects and I want to figure out the risk of a particular operating plan -- for instance, if I'm concerned about the risk of refilling a reservoir based upon what my operation is -- I have to update those historical records to fit the existing situation. I have to figure out the depleted flows, and I have to figure out what those historical flows would have been with today's conditions of population, irrigation and other water use. From that standpoint, the one thing we've had the most trouble with was trying to decide how many acres were being irrigated historically.

WATER RESOURCES DATA MANAGEMENT NEEDS OF CONSULTANTS

GARY ELWELL
HKM Associates
Billings

It is interesting to apparently be the only consultant here since we're the ones that call you all the time and ask for data. Good data is important in almost every project we work on, whether it be drainage for a highway, an airport, water availability studies for a dam, water rights applications, or virtually anything we do. The availability of data is a critical matter.

The problems we have obtaining data, generally speaking, involve having a lack of an index of data that is available. We use information from the SCS, BIA, USGS, Forest Service, and others who have data. As it stands right now, there just isn't a single index that we can review to allow us to efficiently determine what data is available.

Other states that we have worked with have developed systems like the one we've been discussing here. They have the ability to locate data by drainage, county, and other factors that could be important to us (as was the case with the groundwater data base discussed earlier this morning).

A second very important part of obtaining data for our use is the accuracy of the data. It goes without saying that our clients are very concerned with the accuracy of the data we use. They don't want to have to go back and rework a problem because we find out six months into the project that some of the data have been revised. Other states that we've worked with have prepared central data sources of this nature. It has become apparent that it's very important that data be checked and verified. It's also important that revisions and other modification of data be provided to the central data source to keep the data accurate and up to date.

Another concern of ours is the ability to get data in various formats. Sometimes data is available in CFS and we would like acre feet. Sometimes annual values aren't available, only monthly values. It would be very valuable to us as consultants to be able to obtain data in different formats. A fourth problem encountered in obtaining data is related to the actual media by which the data can be obtained, including computer tape, printouts, disks and telecommunications.

I'd like to offer a few suggestions to this group relative to implementing this program. First a database search capability should be created that would allow us to more easily identify what data is available and to identify data having certain characteristics.

A second important suggestion would be to establish a means of checking the accuracy and updating the data from all the various agencies that would be participating in this program.

A third suggestion would be to allow different formats of obtaining the data as I discussed before, the ability to get different units, different statistical analyses, things of the nature the USGS is already doing. Also important is the ability to get the data in its raw form. As consultants, we often times would like to perform our own statistical analysis, to use the data in a way that we see fit. When we first obtain the data, we may not have a concept of all the ways we might want to use the data in the future. So the ability to get raw data in a form that we can use is very important.

Finally, I might just recommend some new ways of providing data to users. In the past we've had problems with getting data on computer tape. A computer tape drive is not readily available to everybody that would like to use this data, so that's a problem. Telecommunications can be expensive when the user has to pay the cost of phone lines. Telecommunication also has historically presented some problems relative to the accurate transmission of data. It's my understanding that starting in the near future the National Weather Service is going to be providing data on diskettes that are compatible with microcomputers and with commonly used programs, such as Lotus 1-2-3 or dBASE III (or other programs that are commonly used by people on their personal computers in this day and age).

We find ourselves as consultants primarily data users, but we are very interested in the ability to obtain this data, the accuracy of the data and the ability to obtain it in a cost-effective and efficient format.

DISCUSSION

GERHARD KNUDSEN

I would now like to open the panel to discussion and comment. You have heard from four individuals who represent a variety of perspectives with regard to the collection and utilization of data in the management of water resources. It is important, too, that the rest of you provide any insight or commentary that you might have.

QUESTION:
Joe Moreland, U.S. Geological Survey

I'd like to direct a question to Ron Russell. You can probably develop the networking as a means to collect data and find out what kind of files an agency has. Once that is completed, there is a real job ahead of some agencies to convert boxes of data into some sort of machine-readable form. Are the agencies going to commit the resources required to get that data into a form that the network can handle? The Forest Service is a good example of an agency that has some data that may not be readable. Is the Forest Service willing to make that commitment to convert the data into that format?

RESPONSE:
Ron Russell, U.S. Forest Service

That's a tough question. I would say that, as an agency, no. In light of Gramm-Rudman and reduced budgets, the only data that's going to come out of the closet and be put into machine-readable form are the data that the agency needs to carry out its mission. That is, the nice to know information that isn't needed for an immediate problem or to answer an immediate management question, will stay in the closet. There are some graduate students around that are looking for projects, and that may be a good way to solve some of that problem. I guess I would comment that, as I see Steve Glasser raise his hand, the Gallatin Forest under Steve's direction did get all of their data out of the closet working with MSU. He was able to put that raw data into an information format. I think there is a possibility to do that, but it's going to take an effort on the individual's part, and it won't be an agency thrust.

RESPONSE:
Steve Glasser, U.S. Forest Service

I think you're hitting the nail on the head. It seems to be, rather than a broad policy thing, it seems to be up to the local individual's sense of priorities, as far as how important it is. I think in terms of what Joe was asking about, the stream flow and water quality information that many of us field hydrologists have been collecting for years is very compatible with (I think) the kinds of things that Joe was talking about, rather than so project-specific that no one else could possibly ever care about it. I wouldn't have any trouble saying yes to Joe, but it will be probably on an individual basis rather than an agency policy to go forth and get all your water quality data and get all of your accumulated boxes

of stream flow charts worked up so that we can enter it into WATSTORE, or whatever.

QUESTION:
Joe Moreland, U.S. Geological Survey

My second question is for Gary. Once the system is working, what happens to it? There has to be a long-term commitment by somebody to maintain the system and ensure that funding is continued to support it. The biggest problem I see is the long-term funding from other agencies or from the Legislature.

RESPONSE:
Gerhard Knudsen, Dept. of Natural Resources & Conservation

Speaking on behalf of the Department of Natural Resources and the State Library who is responsible for the NRIS program, I should note that we see ourselves as facilitators trying to develop a system on behalf of the user. It's a matter of our being a coordinating entity or point contact. I would see that the system should be set up so that it would meet the needs of the users and, at the same time, reflect the reality of available funding. We have established a steering committee for the program that's going to be faced with a related issue: in view of current state and federal funding limitations, do we build a Cadillac or a Volkswagon system? So in the design of the system, we will have to reflect on our resource capabilitites. In time, the needed funding may have to be derived from the users. Again, looking back to Tom Patton's earlier presentation this morning, the groundwater information program is, in a sense just about what we're trying to accomplish -- a service-oriented system. Yet, they too are agonizing over the exact issues you've raised: How do we fund such a program over the long-term? The groundwater program is a very important effort that is confronted with the matter of how to keep it going. I expect that resolving this same issue would be a major chore of the Steering Committee that's going to help us develop the overall water data system. The group is going to have to help us make sure that we design a system that's compatible with our resources at this time. I would hate to see us lose the present momentum of the program by trying to design a Cadillac and fund the front tire of a Volkswagon. That front tire of the Volkswagon will still be useful for us. So, if it comes down to limited funding, we will have to bite off what we can handle.

QUESTION:
Chuck Parrett, U.S. Geological Survey

I'm particularly interested in knowing if we have some model programs that we can look to. Have any of the adjacent states, for example, developed this kind of a system wherein all of the data isn't centralized but rather it's all out in the individual agencies and they're going to try to index different data bases.

RESPONSE:
Gerhard Knudsen, Dept. of Natural Resources & Conservation

In developing the resource information system for Montana, Larry Thompson has been looking around the country and knocking on many doors. The more he knocks on doors, the more he finds there are other states that have been involved in water resource information systems. Again, part of it, goes right back to the old NWUDS days, which I think started a lot of us thinking -- it dragged us into the 20th century on water information. Idaho, I believe, is now embarking on a program like this. It is my understanding that the top program in the nation is in Texas. I guess they have just about everything you'd ever want in an information system -- geographic information, data, you name it, they've got it. The system is expensive, but it really does the job. I know of these two, and Larry informs me that other states are moving ahead with developing systems which are similar to what we are now contemplating for Montana.

COMMENT:
Steve Custer, Montana State University

One of the things that I've noticed about this process is that each of us has our own concept of what data means. We're all sitting here talking about data, yet each of us uses it in different ways and for different purposes. The thing that triggered this thought in my mind was the comment about getting graduate students to do the work. One of the things that I always tell my graduate students, and I would encourage you to implement as part of the things that you are dealing with, first you better have a question in mind. There are certain generic types of things, certain questions that most people are trying to work with. Those are the most important things to get up on that data base. When you start working with a database, if you're going to try to get all water data, heaven help you -- because that consultant's doing little short-term things, I'm doing little short-term things, somebody else is doing long-term things. What are the questions that are the most important to each group, and where do they intersect? Take the intersections and start with those and work on the questions with which most people are concerned, or you will have a Cadillac alright, but it'll be so large and expensive you can't run it. By doing that I think you're going to have another advantage in this system, which is people are going to be willing to fund it because they want that data. I think the question you're working on is very important and shouldn't be ignored.

COMMENT:
Jim Blakely, U.S. Geological Survey

We've had some long experience with what we call office or data coordination. This goes back to an executive order in 1965 which says that all federal agencies will coordinate and gave USGS that responsibility. There was a reference earlier to filling out forms every year. If your providers of data are not also users of that data, you've got a very difficult situation. The reason the Texas system has been successful is that Texas dedicated the resources to do it themselves. They went out and got the data, put it into a system, then maintained the quality

control. You don't do that if you depend on the provider of the data to do those things for you. If the provider's not a user you've got a difficult problem.

COMMENT:
Steve Glasser, U.S. Forest Service

One thing that strikes me regarding the funding is that twice a year I get on my property tax bill and there's always a couple of bucks for conservation districts. For the ten years I've lived in Montana now, I've really wondered what my five or six bucks every six months really accomplishes regarding conservation districts. It strikes me that maybe one way to try to develop a sustained source of funding might be to request something on the order of a water fee or water information fee, something like that. Try to get that through the legislature and have all the citizens pay, maybe initially, a fairly low amount, but once you get something like that going, it has a tendency to perpetuate itself. I sure wouldn't mind paying another couple bucks each year to help support a statewide water database.

CONCLUDING REMARKS

GERHARD KNUDSEN

I wish to thank all of those who participated in this panel discussion. I know that I've learned a great deal and I know that the information that has been presented and the comments that have been made will be utilized in developing a water resource information system for Montana. I would also ask that if you have any other comments about the system, feel free to contact either me or Larry Thompson.

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